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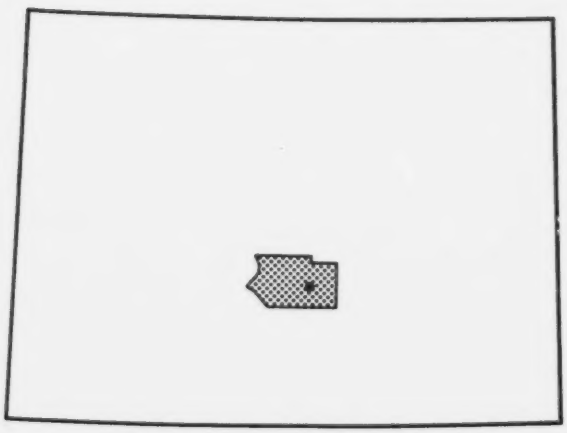
62
ORIGINAL

FLOOD INSURANCE STUDY

CITY OF CANON CITY, COLORADO
FREMONT COUNTY



MAY 3, 1982

Federal Emergency Management Agency

COMMUNITY NUMBER - 080068

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1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the City of Canon City, Fremont County, Colorado, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert Canon City to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Further use of this information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

In some states or communities, flood plain management criteria or regulations may exist that are more restricitve or comprehensive than those in which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 24 CFR, 1910.1(d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended, and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by Camp Dresser & McKee Inc. for the Federal Emergency Management Agency, under Contract No. H-6867. This study was completed in May 1981.

1.3 Coordination

An initial coordination meeting was held on June 26, 1979, attended by city and county officials and representatives of the Federal Emergency Management Agency, the Colorado Water Conservation Board (CWCB), acting as the State Coordination Agency and Camp Dresser & McKee Inc., the study contractor. The purpose of this meeting was to discuss the nature of the study, the scope and limits of work, and flood information currently available concerning the community.

A second coordination meeting was held on November 7, 1979, attended by the City Engineer, two members of the Soil Conservation Service and the study contractor. The city was informed by the study contractor of their intentions and they solicited information on new developments and existing flooding problems in the study area.

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Federal, state, and local agencies were contacted regarding the availability of any reports, studies, or investigations which contained information relative to flooding problems in the community. Information was received from FEMA and CWCB.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the City of Canon City, Fremont County, Colorado. The area of study is shown on the Vicinity Map (Figure 1).

The limits of detailed studies in Canon City were determined by FEMA with community and study contractor consultation at the meeting in June 1979. No flooding sources were studied by approximate methods in Canon City.

During the determination of the study areas for Canon City, it was decided that Northeast Canon Drainage East Branch, Northeast Canon Drainage West Branch, Southeast Canon Drainage, Forked Gulch, West Forked Gulch, and Sand Creek, should be studied in limited detail. Therefore, no floodways have been computed for these streams.

Floods caused by overflow of the Arkansas River, Forked Gulch, Southeast Canon Drainage, Sand Creek, and Northeast Canon Drainage were studied in detail within the corporate limits of Canon City.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction through January 1985.

2.2 Community Description

The City of Canon City is located in south-central Colorado in the eastern portion of Fremont County approximately 46 miles southwest of Colorado Springs, Colorado. The total land area contained within the corporate boundaries is approximately 7.8 square miles. The Colorado Population Report Series CD-26 #79(C-1) reported the population of Canon City in 1979 as 13,341 (Reference 1).

Economic enterprises of the area include ranching, tourism, and some small scale mining, primarily for coal. The Colorado State Penitentiary and the Royal Gorge of the Arkansas River, a major tourist attraction, are located at Canon City. Growth in mining activity for coal and other minerals is anticipated in the future. The Denver and Rio Grande Western Railroad main line passes through the city on its route along the Arkansas River. Traffic on this line is limited to freight and stops are not normally made at Canon City.

Commercial development is concentrated along a single main street with residential areas spreading beyond. The flood plains of all the flooding sources considered in this study are essentially fully

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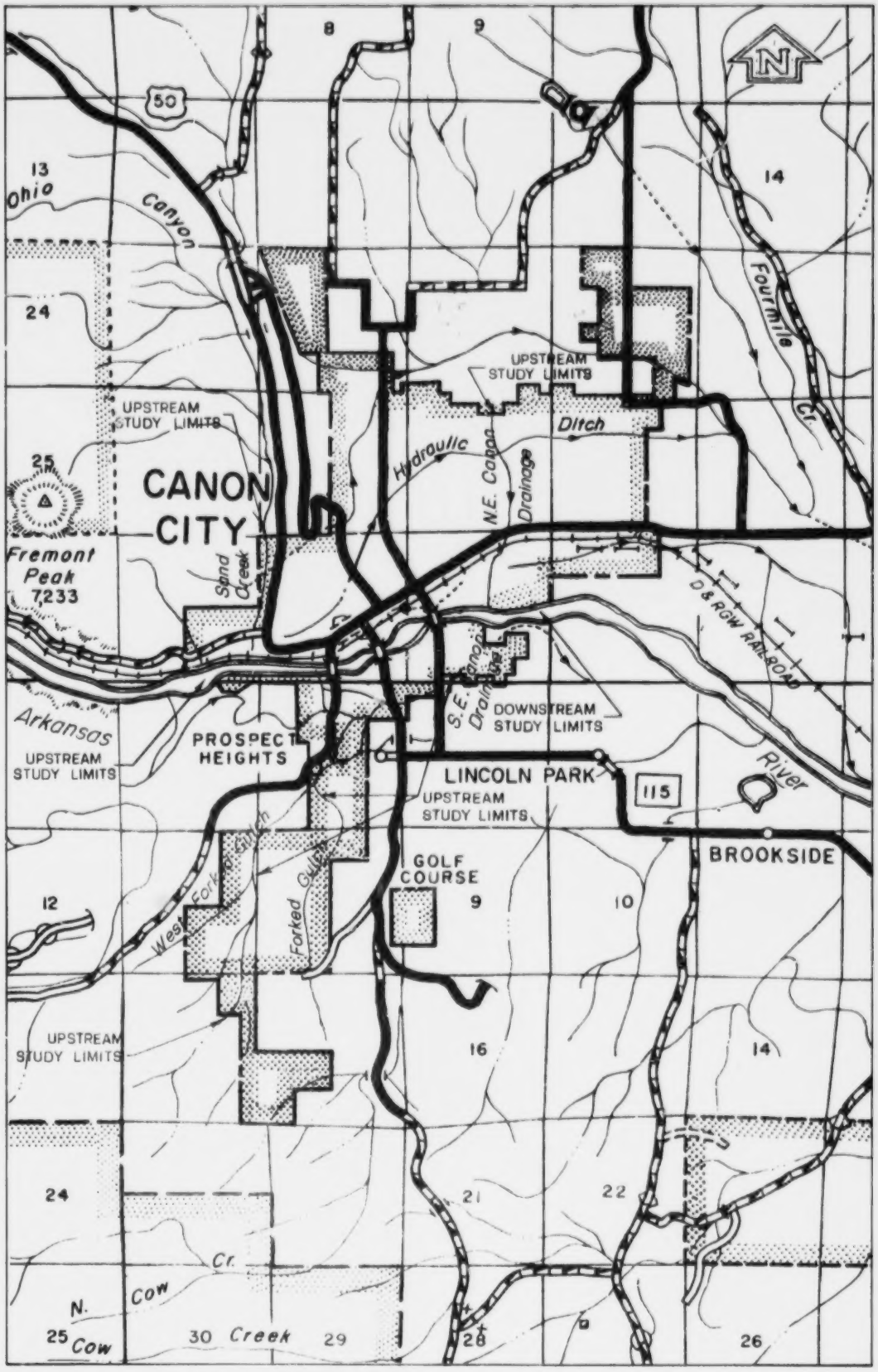

APPROXIMATE SCALE
12,000 6000 0 6000 12,000 FEET

VICINITY MAP

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

FIGURE 1

3

developed, except the upper Forked Gulch area which has recently been annexed into the city. It is currently being developed for residential and some light industrial use. Several commercial and residential areas currently exist in Fremont County, adjacent to the City of Canon City.

The climate in the area of Canon City is semi-arid. Average annual precipitation is 13 inches based on an approximation from the U.S. Department of Commerce Map of Normal Annual Precipitation for the State of Colorado. Periods of drought result from the uneven distribution of precipitation.

The Arkansas River above Canon City is a typical mountain stream which descends 6000 feet in elevation in a distance of less than 130 miles, at gradients often exceeding 50 feet per mile. While slopes are steeper in the upper drainage basins the dense vegetation in these areas serves to reduce rainfall runoff. A greater percent of runoff is permitted by the sparce vegetation of the foothills and pasture land at the lower elevations. Consequently, the majority of flood problems in the study area are caused by cloudburst type storms over the foothills to the south which usually occur during the summer months of June, July and August. Characteristic of this type of flooding is a high intensity, short duration rainstorm of limited areal extent, resulting in a flash flood of high peak flow, short duration, and low total runoff volume.

The characteristics of the drainage basins studied in detail are summarized in Table 1.

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Table 1. Basin Characteristics

Stream	Drainage Area (square miles)	Elevation at Origin (feet)	Elevation at Mouth or Study Limits (feet)	Remarks
Forked Gulch	3.76	7,800	5,320	Originates in Mountains of San Isabel National Forest southwest of Canon City.
West Forked Gulch	2.61	7,800	5,450	Originates in Mountains of San Isabel National Forest southwest of Canon City.
Southeast Canon Drainage	1.27	7,000	5,300	Primarily follows Atchinson Topeka & Santa Fe Railroad.
Sand Creek	12.8	7,800	5,344	Originates at Twin Mountain northwest of Canon City. Lower reach follows U.S. Hwy. 50.
Northeast Canon Drainage	6	6,400	5,282	Originates northeast of Canon City. Lower reach flows through heavy residential area.
Arkansas River	3,117	11,000	5,343	About 53,000 acres diverted. Orginates in mountains above Leadville, Colorado.

Soils of the study area are generally alluvial stream deposits in the lowlands while upland soils are residual soils which have been derived from shale, limestone or sandstone. These residual soils have been buried by alluvial deposits in certain areas.

2.3 Principal Flood Problems

Floods on the Arkansas River are of two general types. One type is represented by "spring floods" which result from melting snow and can often be augmented by rainfall runoff. The other type is represented by "summer floods" which result entirely from rainfall. The spring floods are characterized by comparatively moderate rates of flow of long duration with large volumes of runoff. The summer floods are characterized by high peak rates of discharge with relatively smaller volumes of runoff.

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Detailed information on floods before the turn of the century is very limited. Information on past flooding is based on newspaper accounts and interviews with longtime residents of the area. Large floods occurred at Canon City in 1909, 1921, 1933, 1941, 1957, 1965 and 1974. Peak discharges for these historic flood events were all less than the 10-year flood peak discharge, as predicted by the hydrologic analysis used for this flood insurance study. These floods have caused major damage, disrupting highway and railroad traffic and communication services, drowned livestock, destroyed agricultural lands, roads, bridges, and buildings. Several lives have been lost and numerous others injured.

The flood of August 1921, which registered the highest flood flows ever at Canon City caused the most damage downstream of Canon City. The river reached a discharge of 19,000 cubic feet per second (cfs) (Reference 2), flooding many streets and also washing out many bridges. The railroad through the Royal Gorge and Canon City has been washed out or damaged in the floods of 1909, 1933, 1941, 1947, and 1965. In all of the mentioned floods many bridges were lost and large amounts of acreage were inundated as in the flood of 1957 when 150 to 200 acres of land between Canon City and Florence were under water.

2.4 Flood Protection Measures

Along the lower reaches of Forked Gulch, 500 feet above the confluence with Arkansas River, the city has constructed a concrete lined channel to stabilize the banks to prevent further destruction of the Griffin Avenue bridge. The city has also adopted an ordinance regulating development in the flood plain (Reference 3).

3.0 ENGINEERING METHODS

The flood plains in Canon City were estimated using standard hydrologic and hydraulic study methods to determine the flood hazard data required for this study. Flood events of the magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, and 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rate. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any one year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual occurrence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported here reflect flooding potentials based on conditions existing in the county at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

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3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each stream studied in detail and to compare results between previous reports for the flooding sources under study here.

A regional relationship of basin area to peak discharge was used for the Arkansas River. Gaging stations located within the upper Arkansas basin were used to establish this regional relationship. The method developed by the U.S. Water Resources Council (Reference 4) was used to determine the floodflow-frequency relationship, based on a log-Pearson Type III distribution for each selected gaging station. The annual peak discharges were obtained from U.S. Geological Survey Water-Supply Paper Nos. 1681, 1921, and 3721 (References 2, 5, and 6, respectively) and from Water Resources Data for Colorado (Reference 7). Regional relationships of basin area to peak discharge were determined for the 10-, 50-, 100-, and 500-year floods.

These discharges were then compared to the discharges obtained from the Corps of Engineers' study at Florence, Colorado (Reference 8). The discharges obtained in the regional analysis fell within the 90% confidence limits of the discharges in the Florence report and therefore the hydrologic analysis as presented in the Florence Flood Plain Information Report was adopted for use in estimating the flood boundaries for the Arkansas River. The discharges for the tributaries in Canon City were obtained using the publication "Procedures for Determining Peak Flows in Colorado" (Reference 9). This method was used in the Colorado Water Conservation Board report, "Flood Plain Information Report for Northeast Canon Drainage," (Reference 10). The hydrologic analysis in the Northeast Canon Drainage Report was adopted for this Flood Insurance Study. Rainfall amounts for Forked Gulch, Sand Creek and Southeast Canon Drainage were obtained from National Oceanic and Atmospheric Administration Atlas 2, Precipitation-Frequency Atlas of the Western United States (Reference 11).

Peak discharges for each flooding source are presented in Table 2.

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Table 2. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharge (cfs) 10-Year	50-Year	100-Year	500-Year
Arkansas River At Canon City	3,117	8,850	16,500	20,500	32,200
Forked Gulch At Canon City	3.76	960	2,290	2,790	5,490
West Forked Gulch At Canon City	2.61	760	1,790	2,220	4,100
Sand Creek At Canon City	12.8	1,660	4,060	5,400	9,800
Southeast Canon At Canon City	1.27	170	400	500	920
Northeast Canon Drainage At Canon City	6	1,485	2,275	2,380	3,575

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the flood sources.

Water-surface elevations for the 10-, 50-, 100- and 500-year floods for the Arkansas River, Forked Gulch, Sand Creek, Northeast Canon Drainage, and Southeast Canon Drainage, were computed using the U.S. Army Corps of Engineers HEC-2 Water-Surface Profiles Program (Reference 12). Cross sections for this analysis were obtained from aerial topographic mapping flown in April 1979, coupled with appropriate field verification (Reference 13). All bridges and culverts were measured in the field to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments in which a floodway is computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map. Roughness values (Manning's "n") were determined by field inspection. Ground level photography aided in the selection of roughness factors and aerial photography was used to determine the limits of each roughness zone. Roughness values along the Arkansas River ranged from 0.025 to 0.065 for the flood plain and 0.03 for the channel for all recurrence intervals. Roughness values for the tributaries ranged from 0.03 to 0.06 for the flood plain and 0.016 to 0.06 for the channel.

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Starting water surface elevations for the Arkansas River were obtained by using the slope-area method as described in Reference 10. Starting water surface elevations for the tributaries to the Arkansas River in Canon City were obtained from the Arkansas River profile at the confluence with each tributary. The Arkansas River is the regulatory flooding source in Canon City.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals.

The flood profiles presented in this study are based on the effects of flow through unobstructed hydraulic structures and area, and are considered valid only if these structures do not fail and remain unobstructed.

Horizontal control is based on Colorado State Plane Coordinate System South Zone 1929 U.S. Coast & Geodetic Survey Sea Level Datum. Elevation reference marks used in this study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries for the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:2400, with a contour interval of 2 feet (Reference 13). In cases where the 100- and 500-year flood boundaries are close together, only the 100-year flood boundary has been shown.

Flood boundaries for the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map. Small areas within the flood boundaries may lie above the flood elevations, and therefore, may not be subject to flooding. Owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity and increases flood heights, thus increasing flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood

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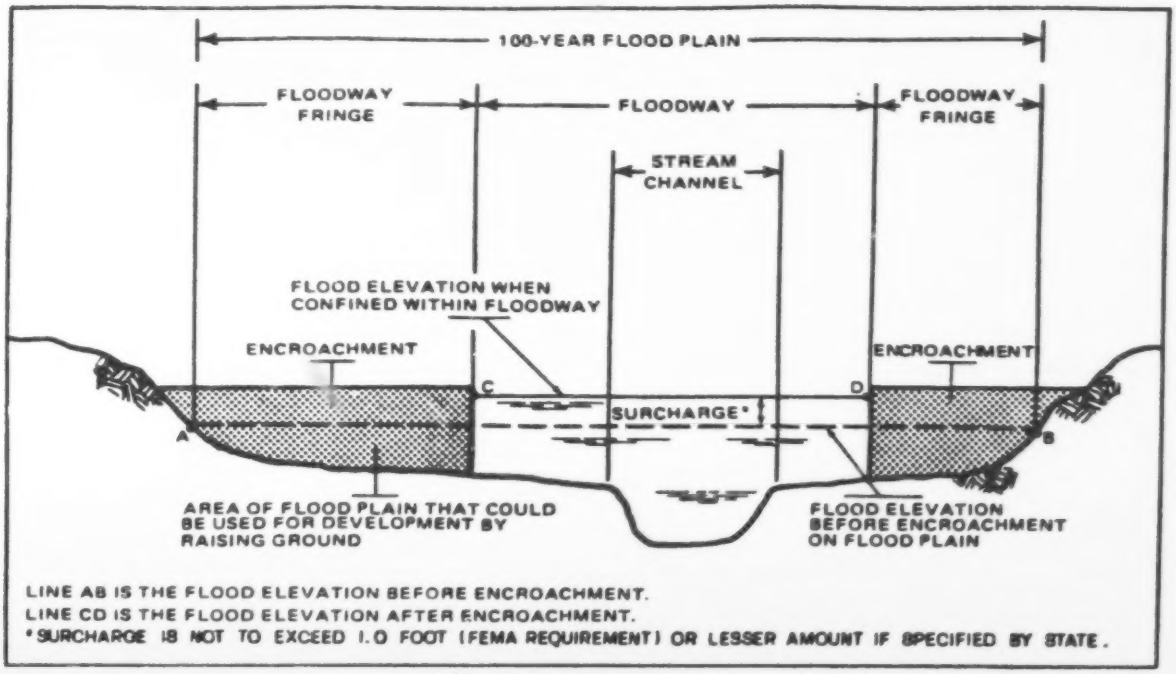
hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communites in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increase in flood heights. Minimum standards of the FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 3). A floodway was only computed for the Arkansas River.

As shown on the Flood Boundary and Floodway Map, the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the floodway and 100-year flood boundaries are close together or colinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.


100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

Floodway Schematic

Figure 2

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY	INCREASE (FEET)
ARKANSAS RIVER								
U[2]								
V	20,078	350/105[3]	2011	10.9	5299.5	5299.5	5300.1	0.6
W	21,558	370	1922	11.4	5308.3	5308.3	5308.3	0.0
X	22,228	168	1789	12.3	5310.4	5310.4	5311.3	0.9
Y	22,288	200	2197	10.0	5310.7	5310.7	5311.6	0.9
Z	24,008	154	1432	15.4	5318.0	5318.0	5318.0	0.0
AA	24,038	186	1968	11.2	5319.0	5319.0	5319.0	0.0
AB	25,118	120	1215	18.1	5324.0	5324.0	5324.0	0.0
AC	25,153	120	1416	15.5	5325.7	5325.7	5325.7	0.0
AD	25,933	493	2559	8.6	5332.8	5332.8	5332.8	0.0
AE	26,683	124	1455	15.1	5334.0	5334.0	5334.0	0.8
AF	26,703	110	1181	18.6	5334.4	5334.4	5334.4	0.0
AG	28,003	190	1546	13.3	5343.2	5343.2	5343.5	0.3
AH	28,858	222	1467	14.0	5347.0	5347.0	5347.0	0.0
AI	29,493	510	2504	8.2	5352.1	5352.1	5352.1	0.0

[1]Feet Above Arkansas River Mile 1327.

[2]Cross-Section U Outside Corporate Limits

[3]Total Width/Width Inside Corporate Limits

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

FLOODWAY DATA

ARKANSAS RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY	INCREASE (FEET)
ARKANSAS RIVER (cont'd)								
AJ	30,033	445	2549	8.0	5352.9	5352.9	5353.6	0.7
AK	30,818	348	1953	10.5	5354.3	5354.3	5355.3	1.0
AL	32,198	206	1686	12.2	5359.3	5359.3	5360.2	0.9

[1]Feet Above Arkansas River Mile 1327.

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

FLOODWAY DATA

ARKANSAS RIVER

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During the determination of the study areas for Canon City, it was decided that Northeast Canon Drainage East Branch, Northeast Canon Drainage West Branch, Southeast Canon Drainage, Forked Gulch, West Forked Gulch, and Sand Creek, should be studied in limited detail. Therefore, no floodways have been computed for these streams.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source studied in detail affecting the City of Canon City.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach:

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot

One reach meeting the above criteria was required for the flooding sources of the City of Canon City along the Arkansas River, one along Sand Creek, one along Forked Gulch, one along West Forked Gulch, two along Southeast Canon Drainage, one along Northeast Canon Drainage East Branch and one along Northeast Canon Drainage West Branch. The locations of the reaches are shown on the Flood Profiles.

5.2 Flood Hazard Factors

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their assigned FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

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.3 Flood Insurance Zones

After the determination of reaches and their respective Flood Hazard Factors, the entire incorporated area of the City of Canon City was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zones A1, A2, A3, A6, and A7:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to Flood Hazard Factors.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

The flood elevation differences, Flood Hazard Factors, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community are sumarized in Table 4.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Canon City is, for insurance purposes, the principal result of these Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevations lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by FEMA.

6.0 OTHER STUDIES

A Flood Plain Information Report for the Arkansas River at Florence, Colorado, by the U.S. Army Corps of Engineers was done in April 1978, (Reference 6). The hydrology computed therein is in agreement with the hydrologic analysis for the Arkansas River contained in this Flood Insurance Study.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (Feet NGVD)
		10% (10-YR)	2% (50-YR)	0.2% (500-YR)			
Arkansas River Reach 1	0002,0004	-3.58	-0.81	3.47	035	A7	Varies - See Map
Northeast Canon Drainage East Branch - Reach 1	0001	-0.26	-0.01	0.30	005	A1	Varies - See Map
Northeast Canon Drainage West Branch - Reach 1	0001	-0.40	-0.09	0.21	005	A1	Varies - See Map
Southeast Canon Drainage Reach 1	0002	-2.92	-0.46	1.63	030	A6	Varies - See Map
Reach 2	0002	-0.58	-0.15	0.46	005	A1	Varies - See Map

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

FLOOD INSURANCE ZONE DATA

ARKANSAS RIVER - NORTHEAST CANON DRAINAGE EAST BRANCH - NORTHEAST CANON DRAINAGE WEST BRANCH - SOUTHEAST CANON DRAINAGE

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (Feet NGVD)
		10% (10-YR)	2% (50-YR)	0.2% (500-YR)			
Sand Creek Reach 1	0004	-3.05	-0.88	1.92	030	A6	Varies - See Map
Forked Gulch Reach 1	0004	-1.17	-0.58	1.17	010	A2	Varies - See Map
West Forked Gulch Reach 1	0005	-1.17	-0.34	0.97	010	A2	Varies - See Map
Reach 2		-1.17	-0.34	0.97	010	A2	Varies - See Map

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

FLOOD INSURANCE ZONE DATA

SAND CREEK - FORKED GULCH - WEST FORKED GULCH

BEST DOCUMENT AVAILABLE

BEST DOCUMENT AVAILABLE

A streambank stabilization report was done for Forked Gulch by the Soil Conservation Service in June 1972 (Reference 14).

A Flood Hazard Analyses was done for Red Canyon Draw by the Soil Conservation Service in January 1976 (Reference 15). The present study results of Northeast Canon Drainage contained herein, generally do not coincide due to differences in hydrologic analyses and topographic base mapping.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, Denver Federal Center, Building 710, Denver, Colorado 80225.

8.0 BIBLIOGRAPHY AND REFERENCES

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BEST DOCUMENT AVAILABLE

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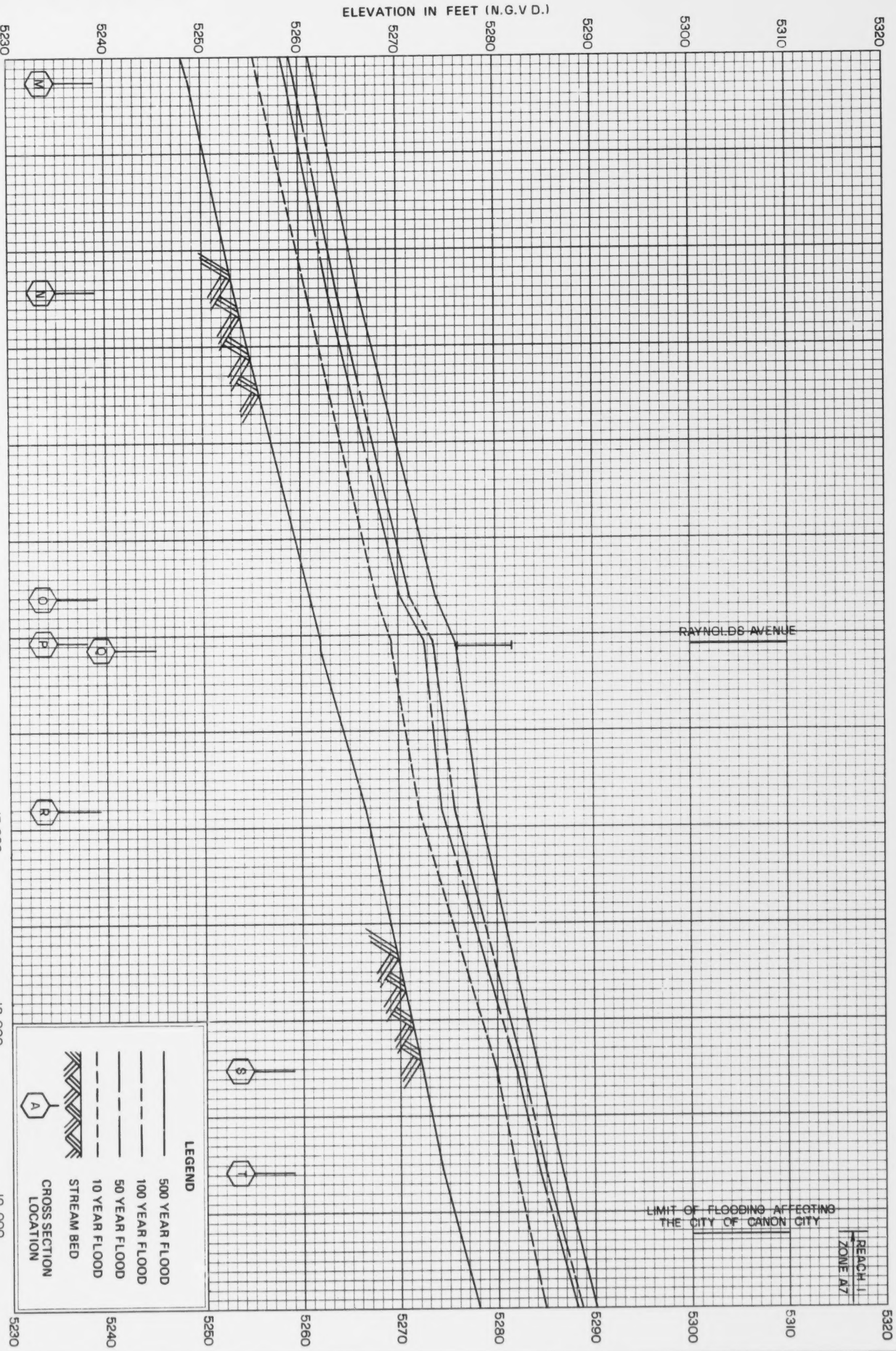
13. 1-inch to 200-foot, 2-foot contour interval, Aerial Topographic Maps, Kucera& Associates, Inc., Denver, Colorado, 1979.

14. U.S. Department of Agriculture - Soil Conservation Service, R.C.&D., Measure Plan, Forked Gulch Streambank Stabilization, June 1972.

15. U.S. Department of Agriculture, Soil Conservation Service, Flood Hazard Analysis, Portions of Red Canyon Draw and Tributaries, January 1976.



FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

FLOOD PROFILES

ARKANSAS RIVER

01P

ELEVATION IN FEET (N.G.V.D.)

5270 5280 5290 5300 5310 5320 5330 5340 5350 5360

20,000 21,000 22,000 23,000 24,000 25,000 26,000

STREAM DISTANCE IN FEET ABOVE ARKANSAS RIVER MILE 1327

CORPORATE LIMITS

CONFLUENCE WITH NORTHEAST CANON DRAINAGE

CONFLUENCE WITH SOUTHEAST CANON DRAINAGE

REACH II
ZONE A7

COLORADO 115
NINTH STREET

ATCHISON TOPEKA AND SANTE FE RAILWAY

W X Y Z AA

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

A CROSS SECTION LOCATION

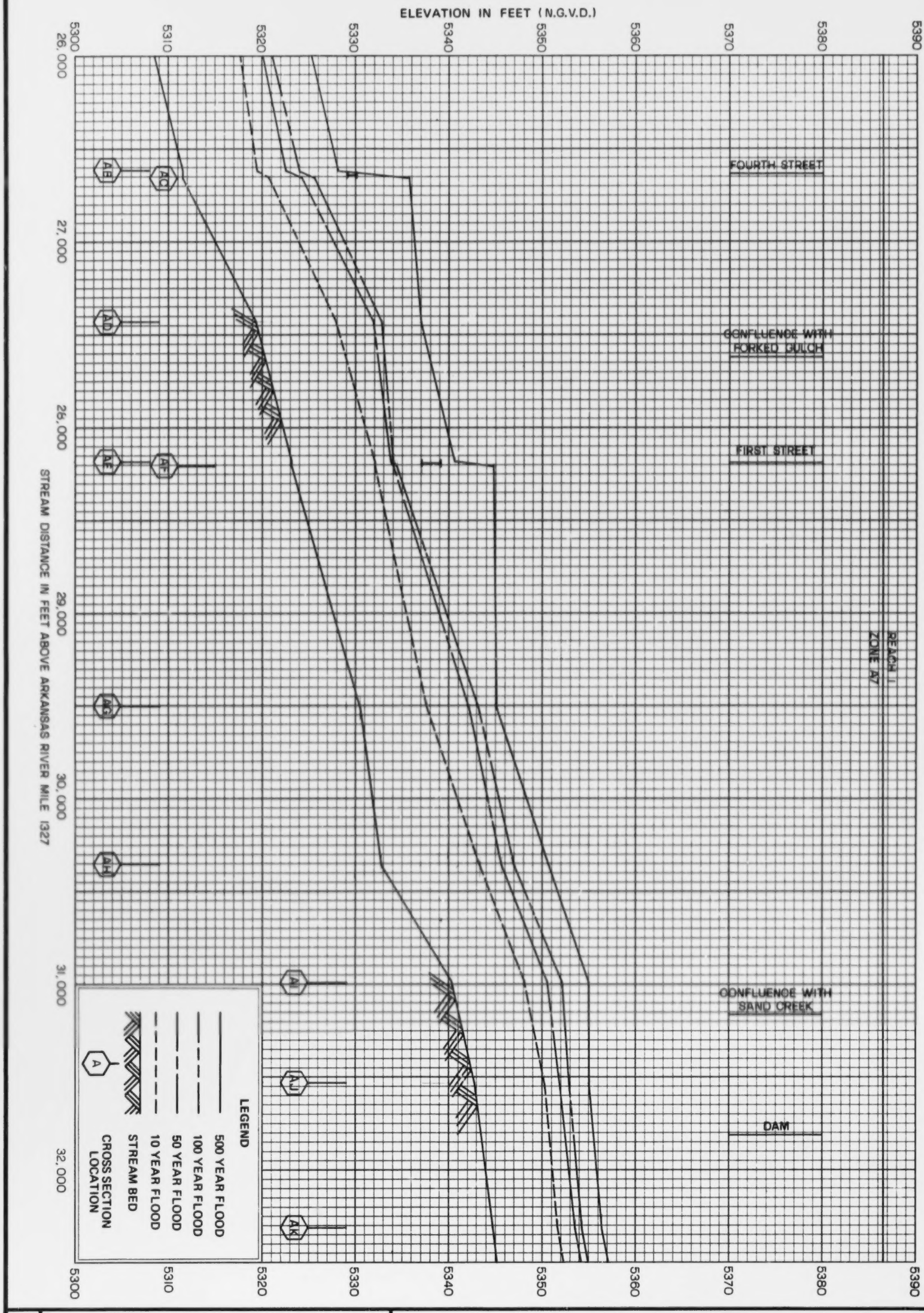
02P

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

FLOOD PROFILES

ARKANSAS RIVER



FEDERAL EMERGENCY MANAGEMENT AGENCY

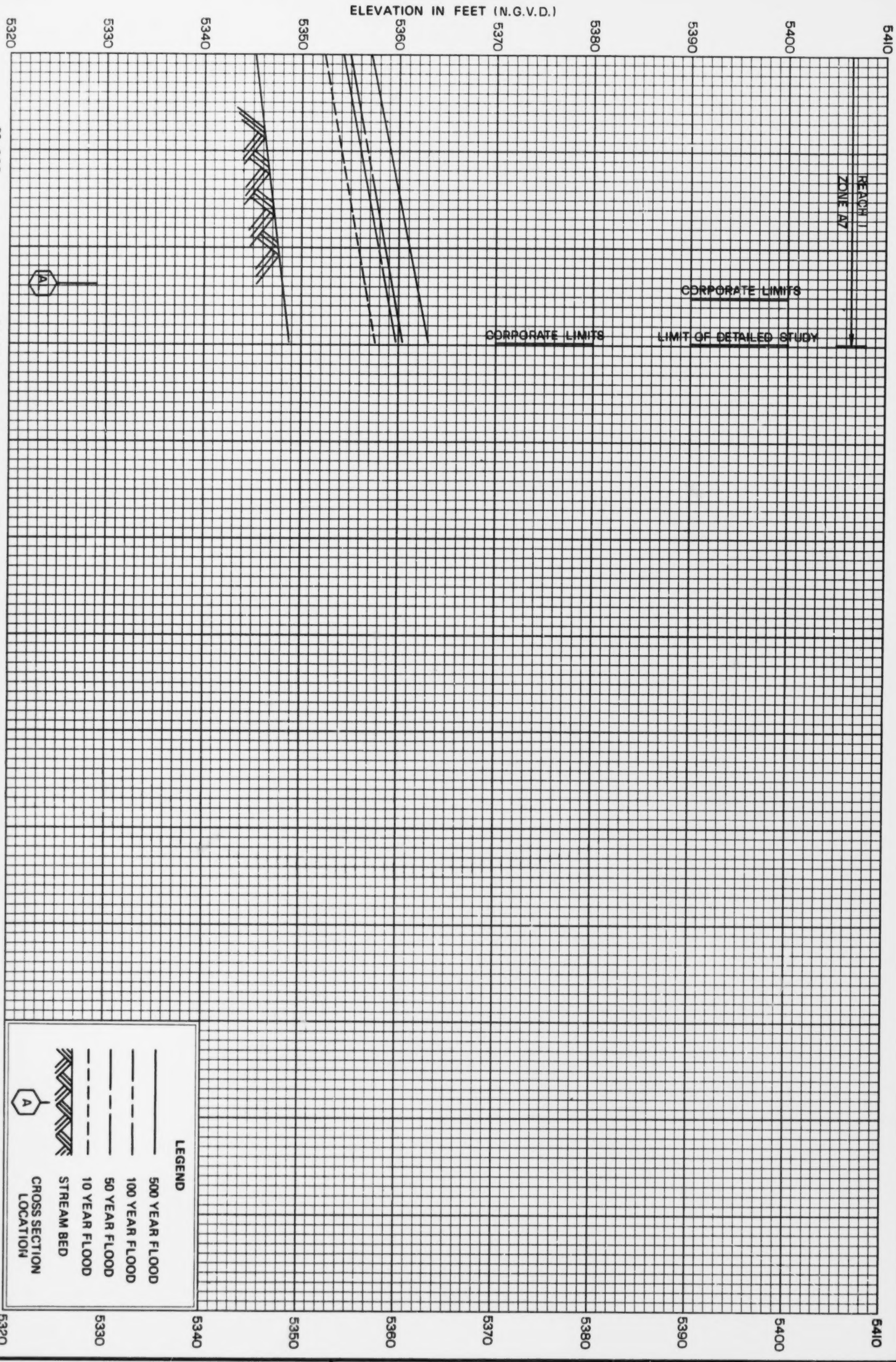
CITY OF CANON CITY, CO
(FREMONT CO.)

FLOOD PROFILES

ARKANSAS RIVER

03P

21



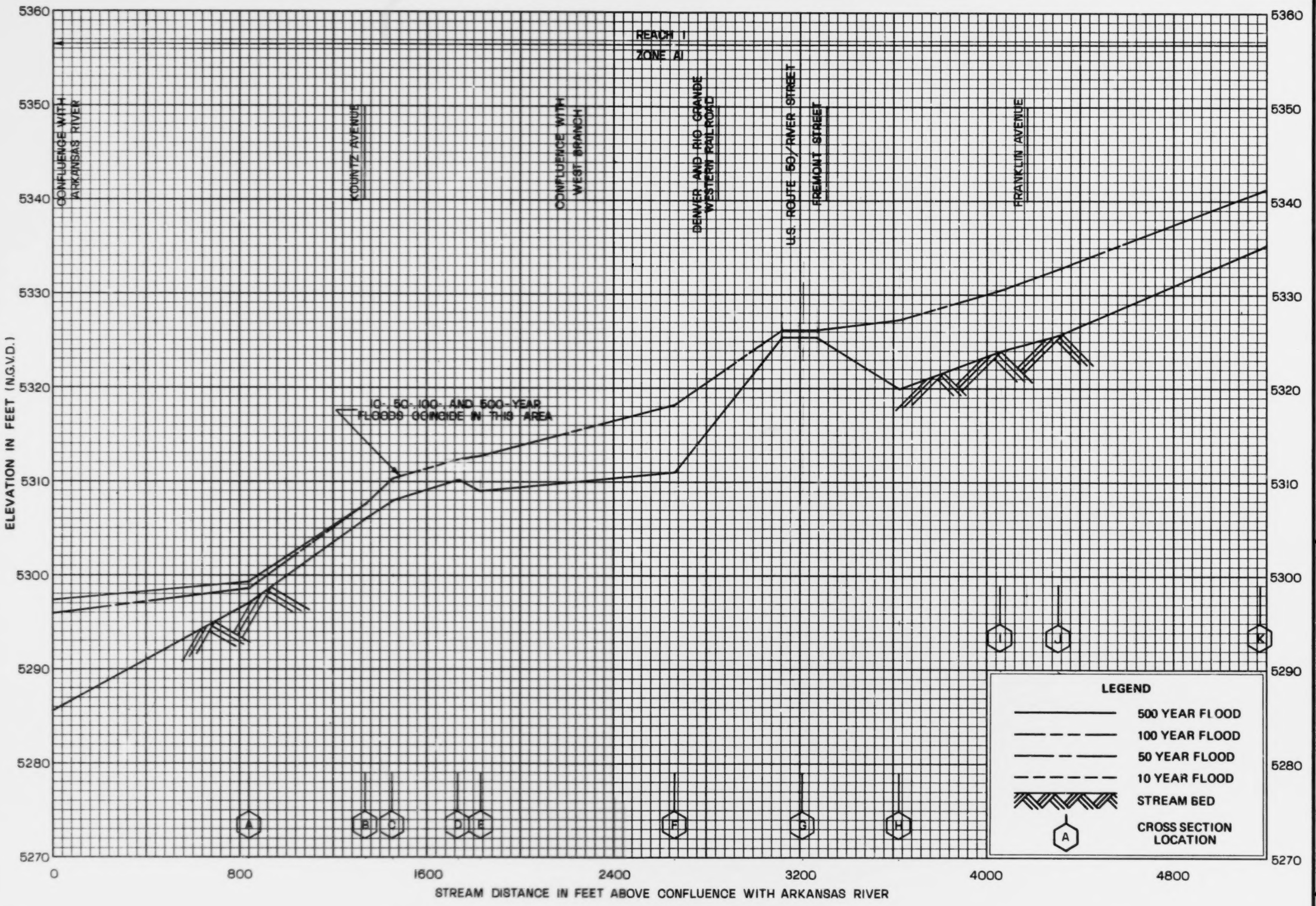
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

FLOOD PROFILES

ARKANSAS RIVER

04P



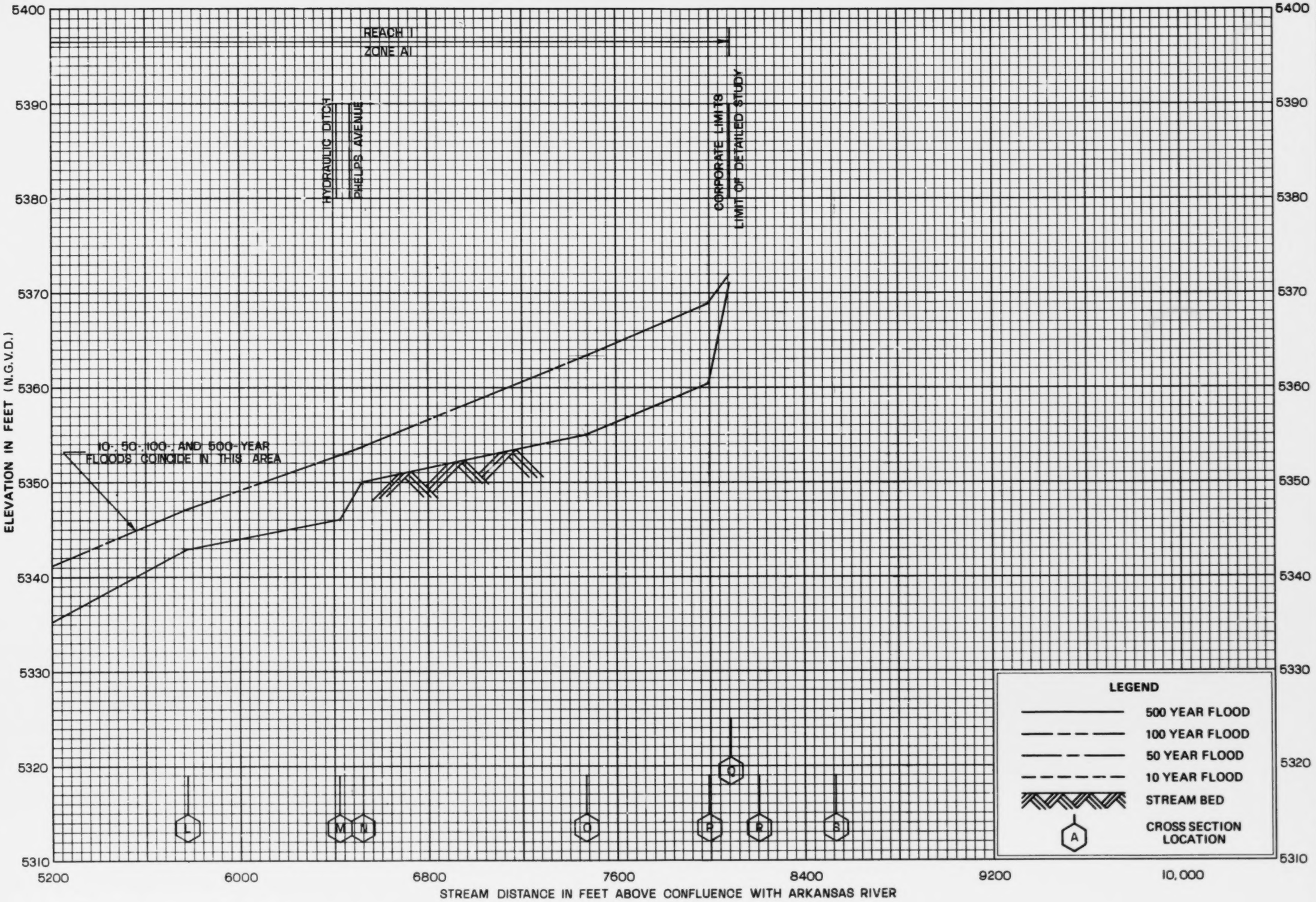
FLOOD PROFILES

NORTHEAST CANON DRAINAGE EAST BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

05P



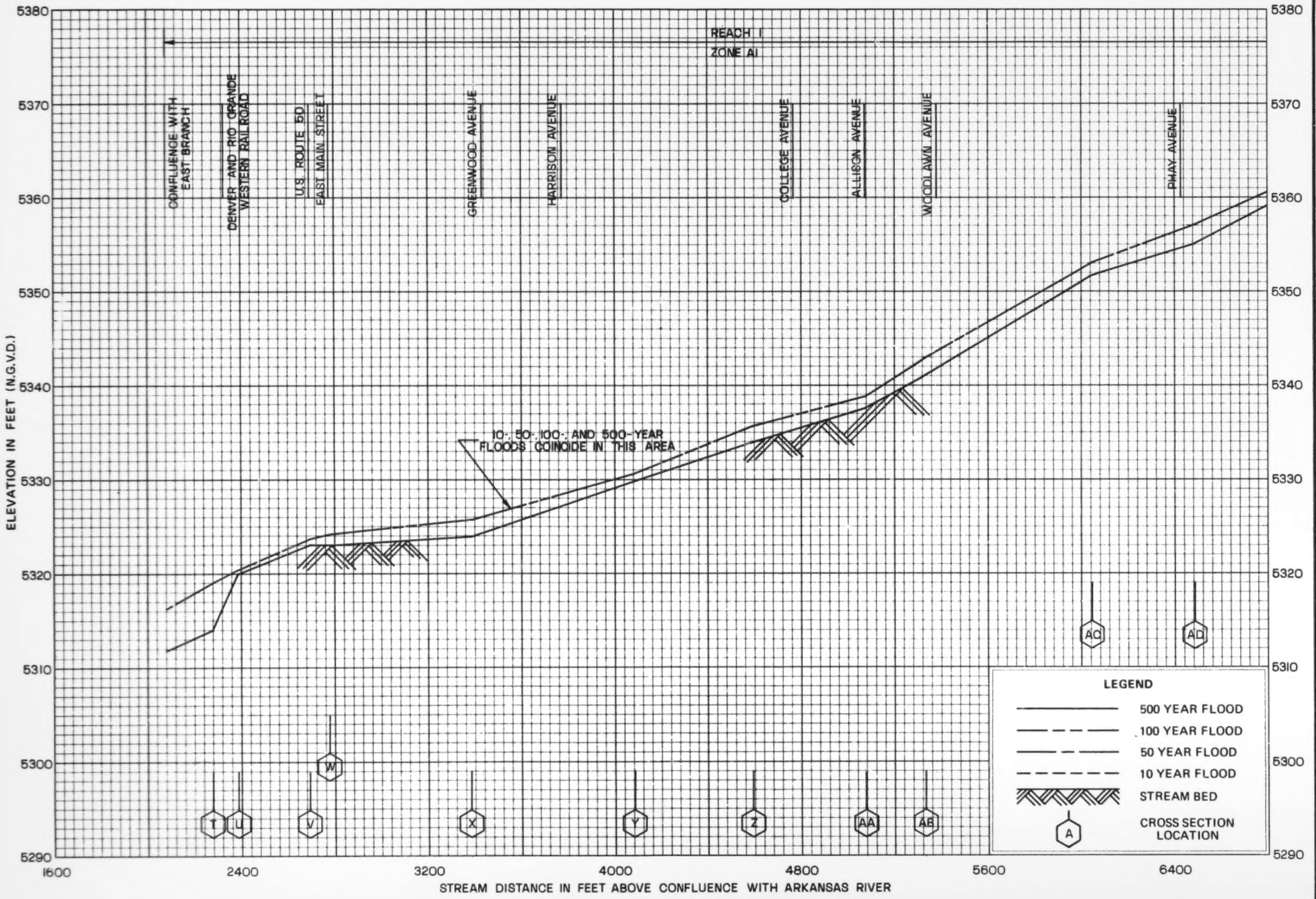
FLOOD PROFILES

NORTHEAST CANON DRAINAGE EAST BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO (FREMONT CO.)

06P



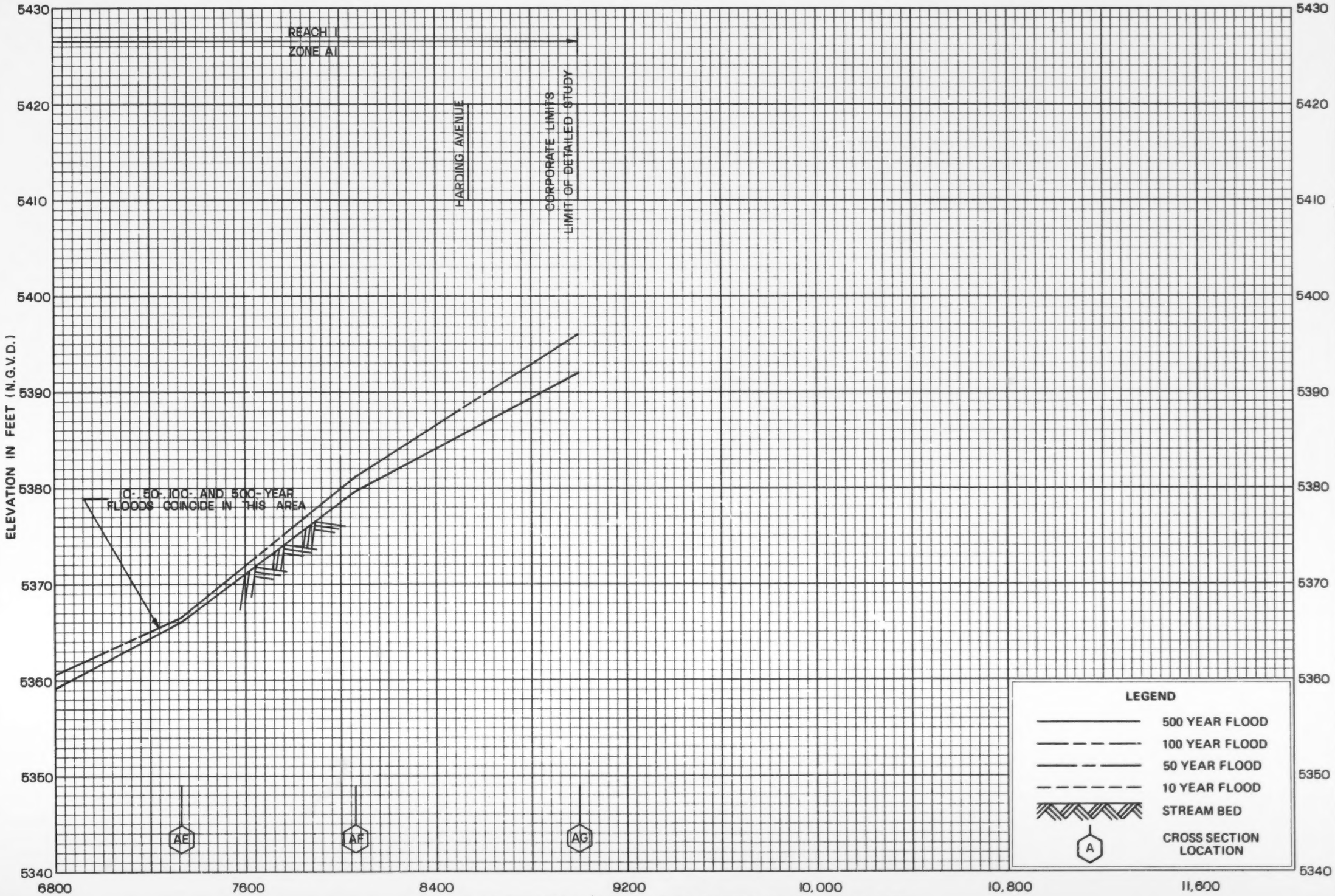
FLOOD PROFILES

NORTHEAST CANON DRAINAGE WEST BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO (FREMONT CO.)

07P



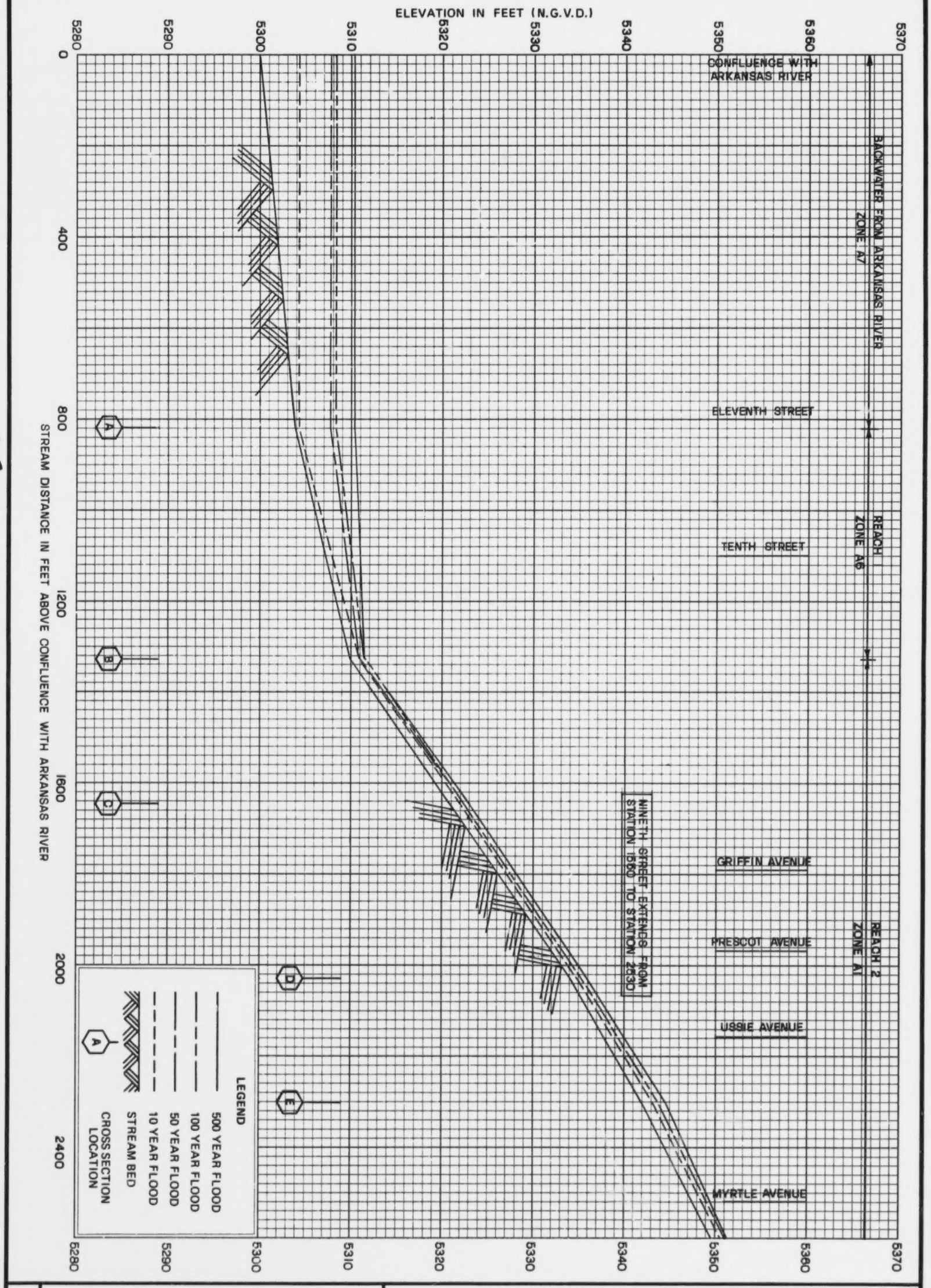
FLOOD PROFILES

NORTHEAST CANON DRAINAGE WEST BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

08P



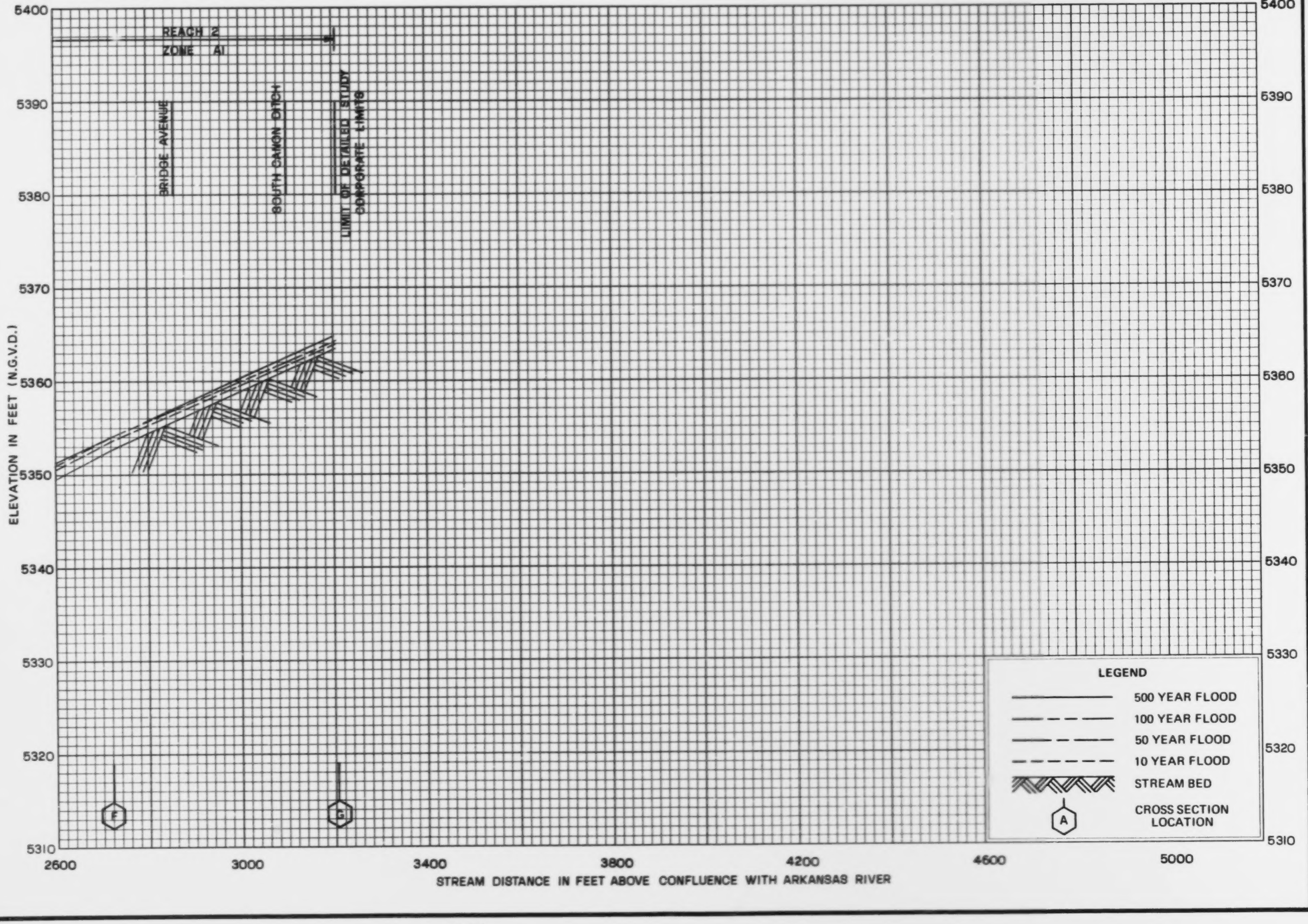
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

09P

FLOOD PROFILES

SOUTHEAST CANON DRAINAGE



FLOOD PROFILES

SOUTHEAST CANON DRAINAGE

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

10P

ELEVATION IN FEET (N.G.V.D.)

5310 5320 5330 5340 5350 5360 5370 5380 5390 5400

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH ARKANSAS RIVER

0 400 800 1200 1600 2000 2400

CONFLUENCE WITH ARKANSAS RIVER

GRIFFIN AVENUE

DOUGLAS AVENUE

STANLEY AVENUE

REACH 1
ZONE A2

SOUTH CANON DITCH

PENNSYLVANIA AVENUE

A B C D E F G H I J K L M N O P Q R

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

CROSS SECTION LOCATION

5310 5320 5330 5340 5350 5360 5370 5380 5390 5400

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

FLOOD PROFILES

FORKED GULCH

11P

REACH 1
ZONE A2

ELEVATION IN FEET (N.G.V.D.)

5450
5440
5430
5420
5410
5400
5390
5380
5370
5360

2600 3000 3400 3800 4200 4600 5000

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH ARKANSAS RIVER

S T U V W X Y Z

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

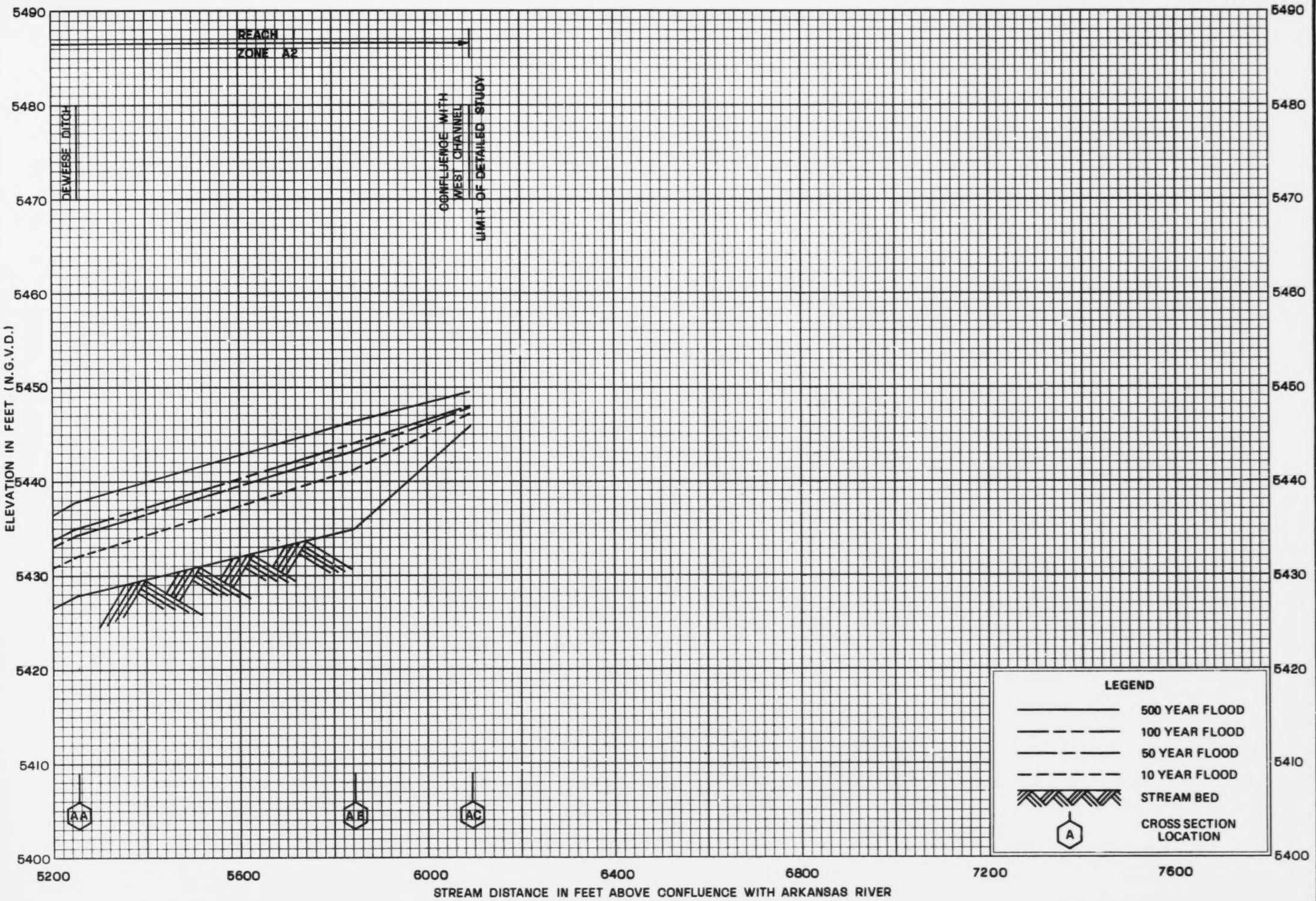
FLOOD PROFILES

FORKED GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

12P



FLOOD PROFILES

FORKED GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

13P

REACH 1
ZONE A2

CONFLUENCE WITH FORKED GULCH

TEMPLE CANON ROAD

CORPORATE LIMITS

ELEVATION IN FEET (N.G.V.D.)

5580
5560
5540
5520
5500
5480
5460
5440
5420
5400

6000 10000 10400 10800 11200 11600 12000

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH ARKANSAS RIVER

A B C D E F G

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

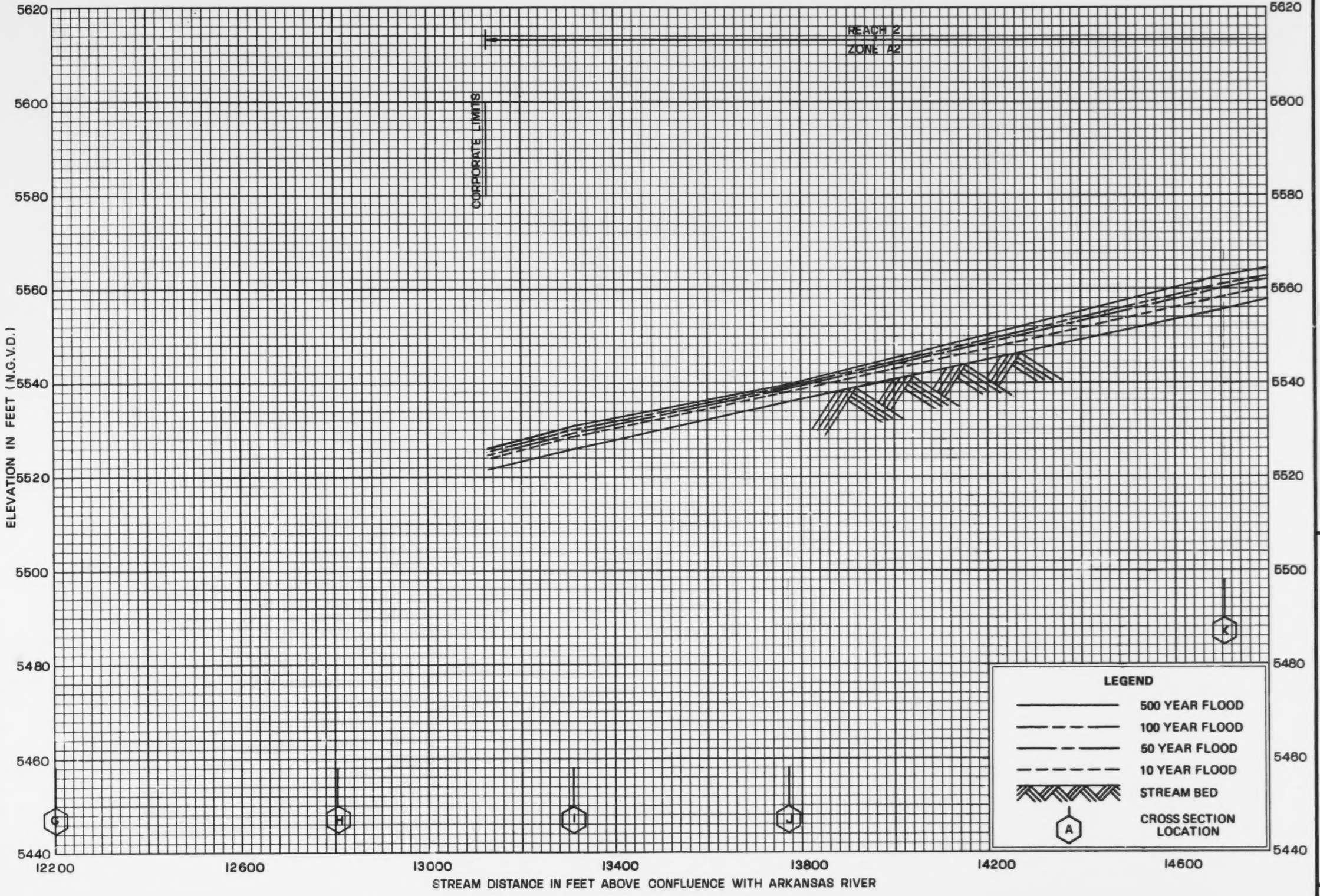
FLOOD PROFILES

WEST FORKED GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

14P



FLOOD PROFILES

WEST FORKED GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

15P

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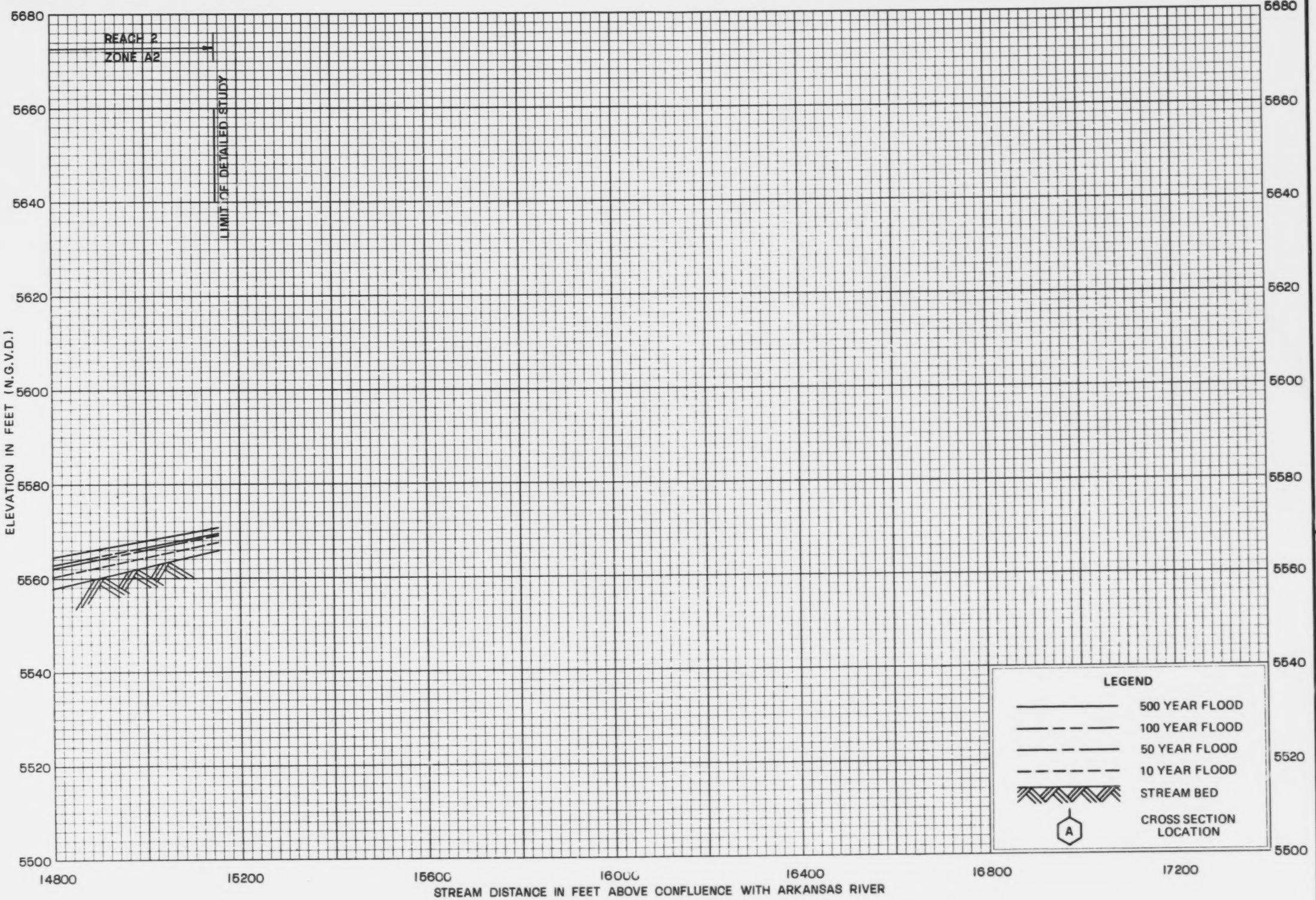

FLOOD PROFILES

WEST FORKED GULCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

16P

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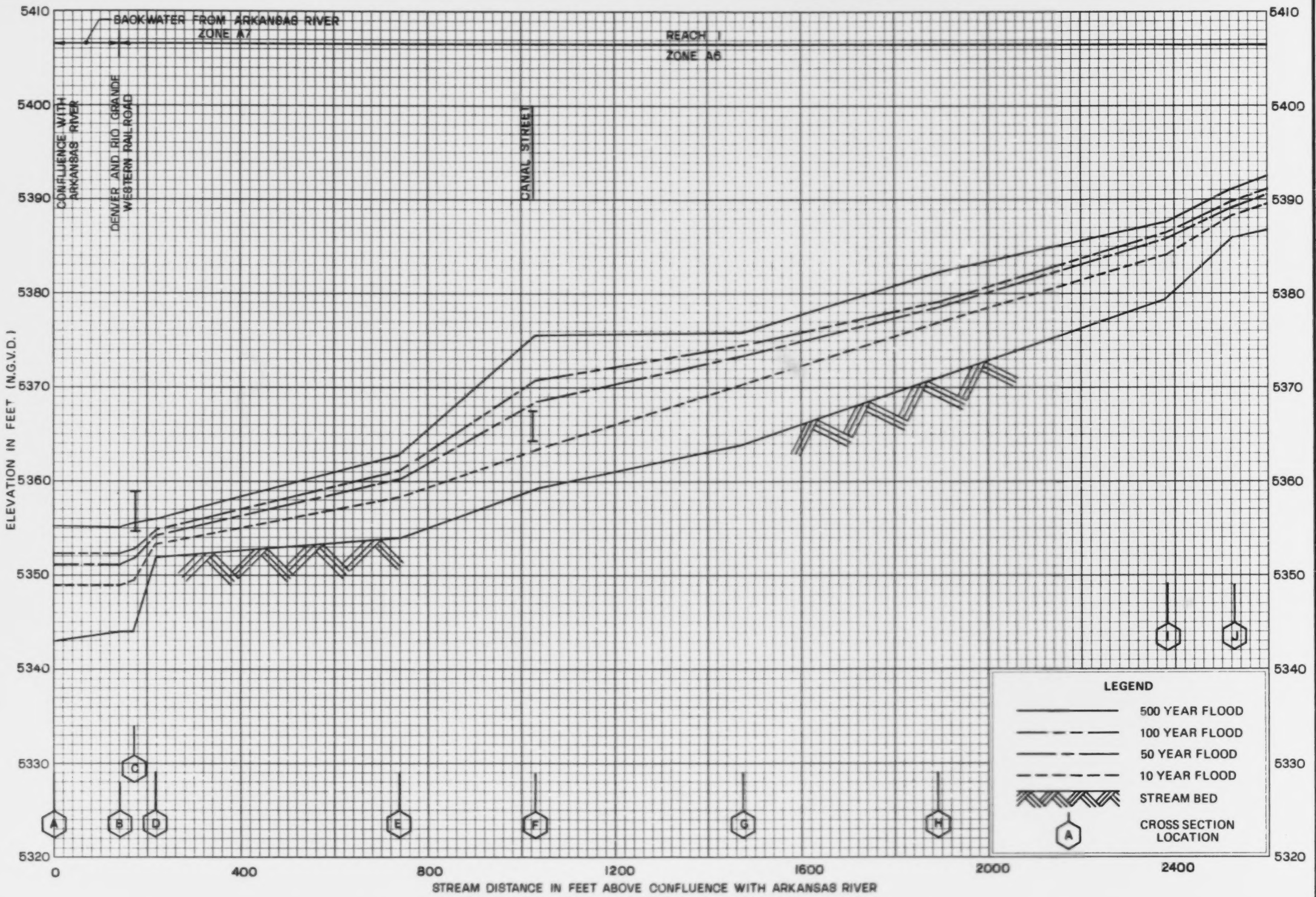

FLOOD PROFILES

SAND CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

17P

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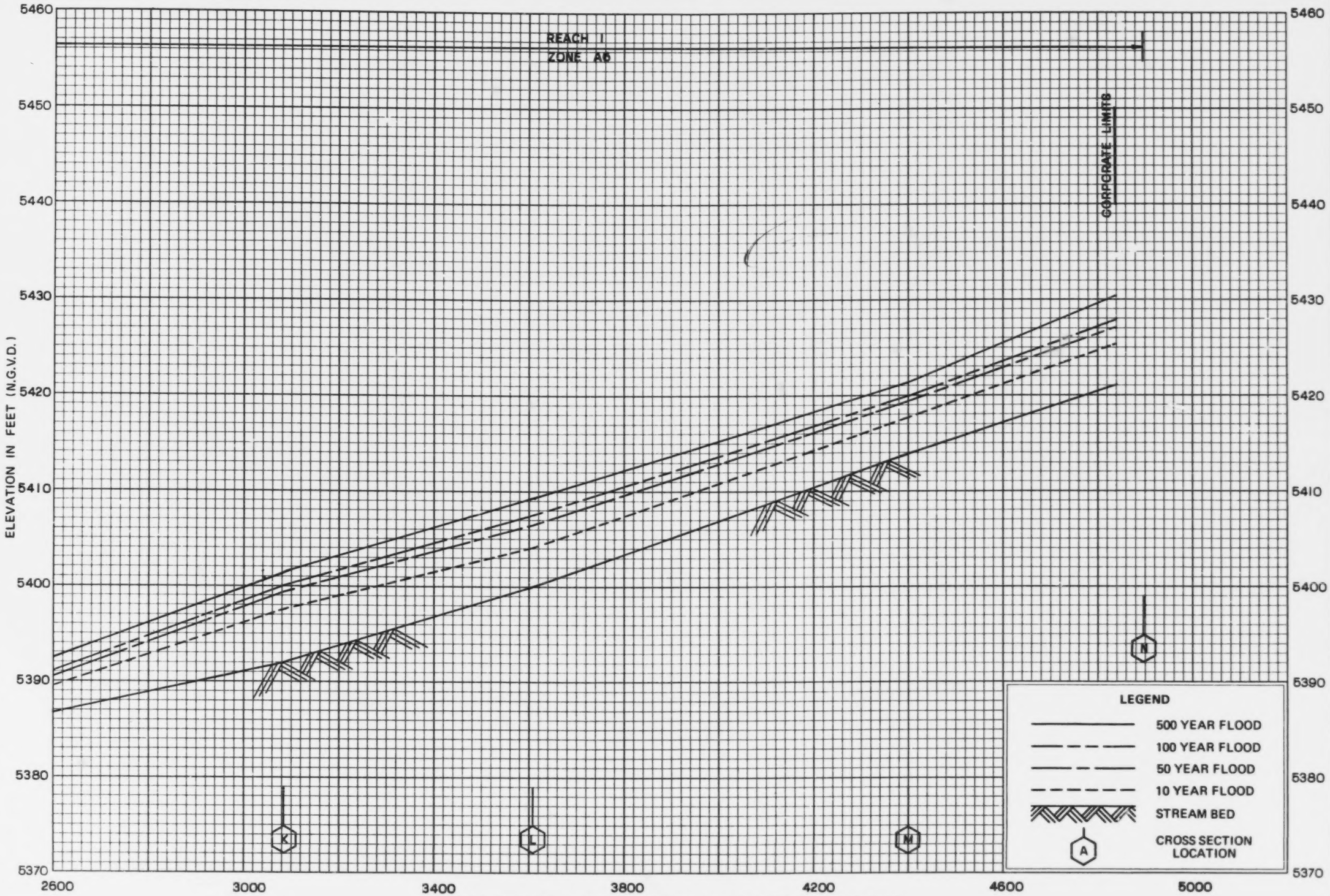

FLOOD PROFILES

SAND CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CANON CITY, CO
(FREMONT CO.)

18P